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STEREOSCOPIC IMAGE DISPLAY DEVICE

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Inventor: NISHIHARA YUTAKA
Applicant: MIXED REALITY SYSTEMS LAB INC
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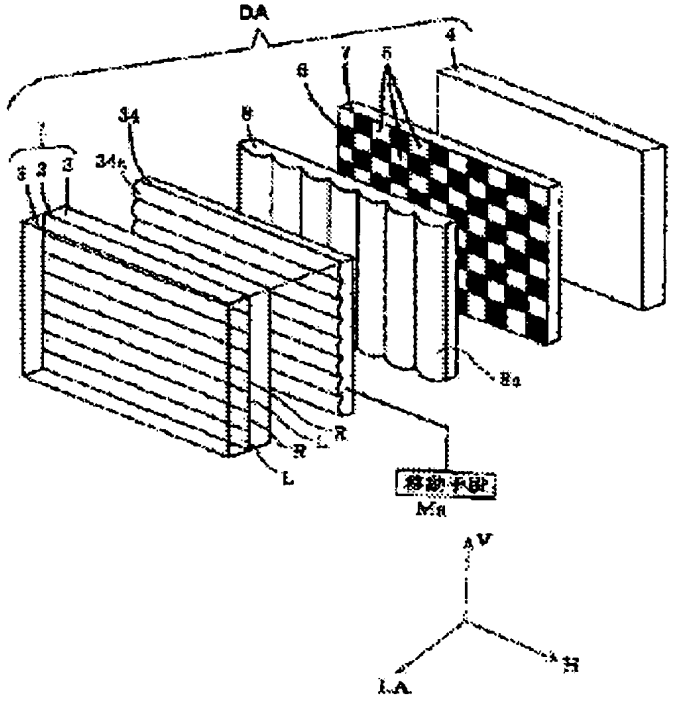
Abstract of **JP2001258051**

PROBLEM TO BE SOLVED: To provide a stereoscopic image display device, that can select a stereoscopic image or a two-dimensional image using a simple configuration, without deteriorating the resolution and displays the selected image. SOLUTION: The stereoscopic image display device is provided with a display device, that can display two-dimensional images and a strip image resulting from arranging alternately left stripe pixels and right stripe pixels, which are obtained respectively by dividing a left eye parallax image and a right eye parallax image into a plurality of stripe pixels in a prescribed sequence into a single image, with an optical means that can provide directivity to luminous flux emitted from a light source means, and allows a viewer to visually recognize a stereoscopic image by separating the stripe image with parallax into different areas which are transmitted through the left or right stripe pixels, when the display device displays the stripe image with parallax, is provided with position revision means, that changes a relative position in the vertical direction of at least one set among the light source means, the optical means and the display device by a prescribed amount and with a position control means that controls the relative position of the set.



Partial English Translation of Japanese Patent Laying-open No. 2001-258051

[0002]

Conventional Art

Conventional Example 1

Conventionally in a system of a method of displaying a stereoscopic image different states of polarization are provided for parallax images for right and left eyes and a pair of polarizing glasses is used to separate the right and left parallax images. To provide different states of polarization, a system is in practical use. More specifically, a display is provided with a liquid crystal shutter and a state of polarization is switched in synchronization with a field signal of an image displayed on the display. An observer wearing a pair of polarizing glasses can separate right and left images for each eye in a time sharing manner to see an image stereoscopically. This system, however, requires that the observer wear the pair of polarizing glasses, which is cumbersome.

[0003] In contrast, there is a method of displaying a stereoscopic image, that does not require a pair of polarizing glasses. More specifically, a lenticular lens is provided at a rear side of a display to spatially separate an image entering the right and left eyes of an observer.

[0004] Fig. 13 is a perspective view of a main portion of a method of displaying a stereoscopic image, as proposed in Japanese Patent Laying-open No. 9-304739 (or conventional example 1). In the figure, a transmission display device 1 is configured of a liquid crystal element. A display pixel unit 2 is configured for example of a liquid crystal layer formed between two glass substrates 3.

[0005] The figure does not show a polarizing plate, a color filter, an electrode, a black matrix, an anti-reflection film or the like. A back light 4 serves as a (planar) source of light for illumination. Between display device 1 and back light 4 is disposed a mask substrate (a mask) 7 having a mask pattern 6 having a checkered opening 5. Mask

pattern 6 is formed by patterning a chromium or similar metal deposited film, a light absorbing material or the like on mask substrate 7 formed of glass or resin. Back light 4, mask substrate 7 and the like each configure an element of light source means. Between mask substrate 7 and display device 1 is disposed a lenticular lens 8 formed of transparent resin or glass. Lenticular lens 8 is an array of vertically elongate, horizontally aligned cylindrical lenses.

[0006] Display device 1 displays an image, as shown in Fig. 14. More specifically, right and left parallax images R and L are divided vertically into a plurality of horizontal stripe pixels Rn and Ln, respectively, which are in turn arranged from the top of the screen alternately to be L1, R2, L3, R4, L5, R6, ... to configure a single image, or a horizontal stripe image.

[0007] Back light 4 emits light which is in turn transmitted through each opening 5 of mask substrate 7 and passes through lenticular lens 8 to illuminate display device 1, and by the observer's eyes, right and left stripe pixels Rn and Ln are observed such that they are separated.

[0008] Figs. 15(A) an d15(B) are a cross section in a horizontal plane passing through right and left stripe pixels Rn and Ln for illustrating how the right and left stripe pixels are horizontally separated and thus observed by the eyes of an observer. Mask substrate 7 is illuminated by back light 4 and light emanates from opening 5. Lenticular lens 8 is disposed adjacent to mask substrate 7 and closer to the observer than mask substrate 7 is, and has a curvature set so that mask pattern 6 is positioned substantially at the position of a focal point of a cylindrical lens 8a. Mask pattern 6 has the opening and a shading portion set to correspond horizontally to one pitch of lenticular lens 8 and vertically, substantially to the stripe pixel's vertical pitch. Fig. 15(A) corresponds to right stripe pixel Rn of the horizontal stripe pixels displayed by display device 1, and the light emanating through opening 5 passes through lenticular lens 8 and illuminates right stripe pixel Rn on display device 1 in a direction, as shown, with directivity. Thus right stripe pixel Rn is observed only by the observer's right eye. Fig. 15(B) corresponds to

left stripe pixel Ln, and shows mask pattern 6 having the opening and shading portion in a relationship inverted from that of Fig. 15(A). In accordance with a similar principle, left stripe pixel Ln is observed only by the observer's left eye.

[0009] If a display device of a stereoscopic image display device employing the method of displaying a stereoscopic image, as described above, displays a normal, or parallax-free, two dimensional image Sa, as shown in Fig. 16, as it is, the two dimensional image has an image S2n and an image S2n + 1 paired with stripe pixel Ln and stripe pixel Rn for left and right eyes, respectively, and arranged in order, n being a positive integer. Accordingly, the right and left eyes receive stripe pixels that are each every other pixel (or are an stripe image) obtained as two dimensional image Sa is divided to provide a horizontal stripe image. Accordingly, if small characters and patterns are displayed they are significantly difficult to observe.

[0010] If to improve this, identical images are input for those for right and left eyes, as shown in Fig. 17, the right and left eyes observe the identical images and thus readily observe an image. However, the resolution thereof would drop to $_1/_2$ of that of a normal two dimensional image.